ORAL ARGUMENT NOT YET SCHEDULED

No. 15-1489

IN THE UNITED STATES COURT OF APPEALS
FOR THE DISTRICT OF COLUMBIA CIRCUIT

SIERRA CLUB,

Petitioner,

v.

UNITED STATES DEPARTMENT OF ENERGY,

Respondent,

AMERICAN PETROLEUM INSTITUTE, LLC, ET AL.,

Intervenors for Respondent.

On Petition for Review of Orders of the Department of Energy 3357-B (November 14, 2014) and 3357-C (December 4, 2015)

PROOF OPENING BRIEF OF PETITIONER SIERRA CLUB

Dated: March 21, 2016.

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CERTIFICATE AS TO PARTIES, RULINGS, AND RELATED CASES

A. Parties

1. Petitioner

Sierra Club

2. Respondent

United States Department of Energy

3. Intervenors

American Petroleum Institute
FLNG Freeport LNG Expansion, L.P.
FLNG Liquefaction, LLC
FLNG Liquefaction 2, LLC
FLNG Liquefaction 3, LLC

B. Rulings Under Review

1. Order 3357-B, Order Authorizing Exports under the Natural Gas Act, 15 U.S.C. § 717b(a) (issued November 14, 2014); and

2. Order 3357-C, Order Denying Rehearing under 15 U.S.C. § 717r(a) (May 6, 2015).

C. Statement of Related Cases

Pursuant to Circuit Rule 28(a)(1)(C), the undersigned states that some of the issues raised in this case are similar to the issues raised in the following cases:

1. *Sierra Club v. Fed. Energy Reg. Comm'n.*, D.C. Circuit Case No. 14-1249.
2. *Sierra Club, et al. v. Fed. Energy Reg. Comm'n.,* D.C. Circuit Case No. 14-1275.
3. *EarthReports, Inc., et al. v. Fed. Energy Reg. Comm'n.*, D.C. Circuit Case No. 15-1127.
4. *Sierra Club v. Fed. Energy Reg. Comm'n.*, D.C. Circuit Case No. 15-1133.

RULE 26.1 DISCLOSURE STATEMENT

Pursuant to Rule 26.1 of the Federal Rules of Appellate Procedure and Circuit Rule 26.1, Petitioner Sierra Club respectfully submits the following disclosures:

Sierra Club has no parent companies and no publicly held company has a 10% or greater ownership interest in Sierra Club.

Sierra Club, a corporation organized and existing under the laws of the State of California, is a national nonprofit organization dedicated to the protection and enjoyment of the environment.

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GLOSSARY OF ABBREVIATIONS

Pursuant to Circuit Rule 28(a)(3), the following is a glossary of acronyms and abbreviations used in this brief, and in the cited portions of the Joint Appendix:

Addendum	Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States
Application	Freeport LNG Expansion, LP, *et al.*, Application for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, Dk. 11-161-LNG (Dec. 19, 2011)
Authorization Order	U.S. Department of Energy, Order 3357-B, Dkt. 11-161-LNG, *Final Opinion and Order Granting Long-Term Multi-Contractual Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas, to Non-Free Trade Agreement Nations* (Nov. 14, 2014)
bcf/d	Billion Cubic Feet Per Day
bcf/y	Billion Cubic Feet Per Year
Btu	British Thermal Units
Climate Action Plan	Executive Office of the President, The President's Climate Action Plan (June 2013)
CO_2e	Carbon Dioxide Equivalent

Conditional Authorization	U.S. Department of Energy, Order 3357, Dkt. 11-161-LNG, *Order Conditionally Granting Long-Term Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from the Freeport LNG Terminal on Quintana Island, Texas to Non-Free Trade Agreement Nations* (Nov. 15, 2013)
DEIS	Draft Environmental Impact Statement
DOE/FE	Department of Energy/Office of Fossil Energy
Domestic Life Cycle Report	National Energy Technology Laboratory, Life Cycle Analysis of Natural Gas Extraction and Power Generation (May 29, 2014)
EIA	Energy Information Administration
EIA Export Study	U.S. Energy Information Administration, Effect of Increased Natural Gas Exports on Domestic Energy Markets (January 2012)
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
Gas Production Totals	Energy Information Administration, Natural Gas Withdrawals and Production (Feb. 29, 2016)
GHG	Greenhouse Gas

GWP	Global Warming Potential
JA	Joint Appendix
LCA GHG Report	National Energy Tech. Lab., Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States (May 29, 2014)
LNG	Liquefied Natural Gas
MJ	Mega Joule
MMBtu	Million British Thermal Units
MWh	Megawatt Hour
NEPA	National Environmental Policy Act
NERA Study	National Economic Research Associates, Macroeconomic Impacts of LNG Exports from the United States (Dec. 3, 2012)
NO_x	Nitrogen Oxides
P or PP	The internal paragraph number or numbers within a FERC order.
Rehearing Request	Sierra Club, Request for Rehearing, Dk. 11-161-LNG (Dec. 15, 2014)
Rehearing Order	U.S. Department of Energy, Order 3357-C, Dkt. 11-161-LNG, *Opinion and Order Denying Request for Rehearing of Orders Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from Freeport LNG Terminal*

	on Quintana Island, Texas to Non-Free Trade Agreement Nations (Dec. 4, 2015)
Scf	Standard Cubic Foot
Unconventional Production Report	National Energy Tech. Lab., *Environmental Impacts of Unconventional Natural Gas Development and Production* (May 29, 2014)
Updated EIA Export Study	Energy Information Administration, Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Markets (Oct. 29, 2014)
VOC	Volatile Organic Chemicals

JURISDICTION

This petition seeks review of two Department of Energy ("DOE") orders: 3357-B, authorizing exports under the Natural Gas Act under 15 U.S.C. § 717b(a) (issued November 14, 2014) ("Authorization Order"), Joint Appendix ("JA")____, and 3357-C, denying Sierra Club's request for rehearing of the same under 15 U.S.C. § 717r(a) (issued December 4, 2015) ("Rehearing Order"), JA____. The petition was timely filed on December 22, 2015. This Court has jurisdiction under 15 U.S.C. § 717r(b).

ISSUES FOR REVIEW

DOE authorized Freeport LNG Expansion, L.P., FLNG Liquefaction, LLC, FLNG Liquefaction 2, LLC, and FLNG Liquefaction 3, LLC (together, "Freeport") to export 146 billion cubic feet of natural gas as liquefied natural gas ("LNG") per year for twenty years. This figure amounts to roughly 0.5 percent of annual U.S. gas production. In issuing these orders:

(1) Did DOE violate the National Environmental Policy Act, 42 U.S.C. § 4332, by approving the project on the basis of an Environmental Impact Statement that provided no analysis of:

a. the "cumulative effects" of proposed liquefied natural gas exports, despite the fact that DOE had approved or was in the process of reviewing export proposals amounting to 13 percent of U.S. gas production?

b. the "indirect effects" on the domestic energy market of authorizing the Freeport natural gas exports, despite the fact that DOE's economic analysis of these exports relied on studies that predicted that increasing exports would increase both U.S. gas production and coal use?

c. the "indirect effects" that would result from combusting this gas after export, despite evidence in the record indicating that exports would increase overall energy consumption and displace, in part, non-polluting renewable forms of energy?

(2) In determining whether the proposed exports were "consistent with the public interest" for purposes of the Natural Gas Act,

15 U.S.C. § 717b(a), did DOE act arbitrarily or capriciously in concluding that, although the exports would have adverse environmental impacts, these impacts were outweighed by non-environmental benefits, where DOE provided quantitative assessment of the benefits but failed to quantify these harmful environmental impacts, despite the availability of tools to do so?

STATUTES AND REGULATIONS

Pertinent statutes and regulations are reproduced in an addendum.

STATEMENT OF THE CASE

I. Introduction

This case concerns DOE's approval of an application seeking permission to export liquefied natural gas ("LNG") from the United States. In response to the large number of such applications, DOE commissioned several studies, by the Energy Information Administration ("EIA") and others, on the effects of LNG exports on domestic energy markets. These studies have uniformly concluded that exports link U.S. natural gas supplies with otherwise inaccessible foreign demand, and that the additional demand created by exports will raise U.S. gas prices, increase natural gas production, and make other, more polluting fuels (primarily coal) more competitive in the domestic energy market. *See, e.g.*, EIA, Effect of Increased Natural Gas Exports on Domestic Energy Markets (January 2012) ("EIA Export Study") at 6, JA____. The increase in gas prices will depress real wages and cause other economic harm, but DOE has consistently concluded that these harms would be outweighed by the profits generated by increased gas production and, secondarily, selling the gas to foreign buyers. DOE, Freeport LNG Expansion, Order 3357, Dkt. 11-161-LNG, *Order*

Conditionally Granting Authorization, (Nov. 15, 2013) at 52, 151-152, JA____, ____-_____ ("Conditional Authorization").

Despite its conclusion that domestic gas production would increase in response to increased exports, DOE refused to examine the environmental impacts of this increase in gas production. 40 C.F.R. § 1508.8(b) (requiring analysis of "indirect effects."). DOE relied on an Environmental Impact Statement ("EIS") prepared by the Federal Energy Regulatory Commission ("FERC") that provided no analysis of these impacts whatsoever. DOE separately produced an "Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States" ("Addendum"), JA____, which recognized that, in general, gas production causes a range of environmental harms, including water-resources impacts and emissions of greenhouse gases and other air pollutants. Yet this Addendum did "not attempt to identify or characterize the [above] incremental environmental impacts that would result from LNG exports." DOE, Freeport LNG Expansion, L.P., Order 3357-B, Dkt. 11-161-LNG, *Final Opinion and Order Granting Authorization* (Nov. 14, 2014) at 84, JA____ ("Authorization Order"). The Addendum did not, for example, discuss the amount or impact of additional air pollution that would be emitted by export-driven increases in gas production. Nor has DOE evaluated the environmental effects of export-driven increases in coal use, even though DOE's own study concluded that electric utilities would burn more coal as a result of increased gas exports raising domestic gas prices. EIA Export Study at 18, JA____.

DOE's EIS also failed to provide any discussion of the effects caused by exports once the ship leaves the port: the effects of transporting, regasifying, and burning LNG. DOE produced a separate document comparing the "life cycle" greenhouse gas emissions of electricity generated overseas using U.S.-sourced LNG with electricity generated using coal or other sources of gas. Nat'l Energy Tech. Lab., Life Cycle Greenhouse Gas Perspective on Exporting Liquefied Natural Gas from the United States (May 29, 2014), JA____ ("Global Life Cycle Report").[1] DOE also acknowledged that U.S. LNG would also compete with renewables or conservation in overseas energy markets, but DOE failed to provide any discussion of the effects of such competition.

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[1] DOE refers to this as the "LCA GHG Report." *See, e.g.*, 79 Fed. Reg. 32,260, Authorization Order at 7, JA____, Rehearing Order at 7, JA____.

DOE argues that it was not required to analyze the impacts of increased exports because it believes that these impacts are not "reasonably foreseeable" within the meaning of NEPA's implementing regulations. But the record demonstrates that these impacts are foreseeable, as shown by DOE's own studies, and that DOE has the tools necessary to provide this analysis. Indeed, in the Addendum and other documents, DOE summarized many of these tools, found no fault with them, yet failed to employ them. The exports authorized by DOE threaten to radically transform the domestic natural gas market: by refusing to undertake the "reasonable forecasting" required to disclose the effects of that transformation, DOE violated NEPA. *Del. Riverkeeper Network v. FERC*, 753 F.3d 1304, 1310 (D.C. Cir. 2014) (quoting *Scientists' Inst. for Pub. Info., Inc. v. Atomic Energy Comm'n*, 481 F.2d 1079, 1092 (D.C. Cir. 1973)) (modification omitted).

In addition to failing to provide the analysis required by NEPA, DOE's assessment of whether, for purposes of the Natural Gas Act, exports were consistent with the "public interest" was arbitrary and capricious. In this assessment, DOE must consider effects on gas supplies and the environment. *NAACP v. Fed. Power Comm'n*, 425 U.S. 662, 669–70, 670 n.6 (1976). DOE recognized that export-driven increases in gas production would have adverse environmental effects, but concluded that these impacts were outweighed by the "economic and international benefits" of exports. Authorization Order at 87, JA_____. Because DOE failed to even attempt to "identify or characterize" the environmental impacts of exports, however, the record did not provide a basis for DOE to conclude that those impacts would be outweighed by other benefits. Because DOE failed to articulate a rational connection between its discussion of impacts and its assessment of their importance, DOE's conclusion was arbitrary and capricious.

II. Legal Framework

A. Natural Gas Act

The Natural Gas Act governs export of "natural gas from the United States." The Act originally vested authority in the Federal Power Commission; that authority has been transferred to DOE. DOE, Redelegation Order No. 00-002.04E (Apr. 29, 2011). Section 3 of the Act requires federal authorization of natural gas exports, which can be granted only if DOE finds "that the proposed exportation" will be "consistent with the public interest." 15 U.S.C. § 717b(a).[2]

DOE has interpreted this "public interest" provision to encompass: "(i) the domestic need for the natural gas proposed to be exported, (ii) whether the proposed exports pose a threat to the security of domestic natural gas supplies, (iii) whether the arrangement is consistent with DOE/FE's policy of promoting market competition, and (iv) any other factors bearing on the public interest described herein." Conditional Authorization at 9, JA____. Both courts and DOE have recognized that "other factors" must include environmental impacts and effects on natural gas production and supply, notwithstanding the fact that the Act does not directly regulate gas production. *NAACP v. Fed. Power*

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[2] A separate provision not at issue here requires automatic approval of exports to nations "with which there is in effect a free trade agreement requiring national treatment for trade in natural gas." 15 U.S.C. § 717b(c). DOE has identified 18 nations meeting this criterion. *See http://energy.gov/fe/services/natural-gas-regulation/how-obtain-authorization-import-andor-export-natural-gas-and-lng#LNG*. Nothing in the record indicates that these countries are likely to be significant importers of U.S. LNG.

Comm'n, 425 U.S. at 669–70, 670 n.6; *Myersville Citizens for a Rural Cmty., Inc. v. FERC*, 783 F.3d 1301, 1307 (D.C. Cir. 2015); *see also* Conditional Authorization at 8, JA____.

The Natural Gas Act also regulates "the siting, construction, expansion, or operation" of LNG infrastructure. 15 U.S.C. § 717b(e)(1). DOE has delegated this authority to the Federal Energy Regulatory Commission ("FERC"). DOE Delegation Order No. 00-004.00A, ¶ 1.21 (May 16, 2006). FERC applies the same Natural Gas Act "public interest" standard to evaluate LNG infrastructure proposals. *See Freeport LNG Development, LP*, 148 FERC ¶ 61,076, P27 (July 30, 2014), JA____. FERC's approval of the Freeport terminal is the subject of another case pending before this Court, No. 14-1275.

B. National Environmental Policy Act

Congress passed NEPA with the recognition that industrial expansion and growth could cause "unplanned and often unforeseen consequences in the form of resource depletion, pollution … and other aspects of environmental degradation." S. Rep. No. 91-296, at 79 (1969), *reprinted in* U.S.C.C.A.N. 1969, 2751.

NEPA, accordingly, imposes a common-sense requirement that agencies look before they leap: "'all agencies of the federal government' [must] prepare a detailed environmental analysis" for "major federal actions significantly affecting the quality of the human environment." *Found. on Econ. Trends v. Heckler*, 756 F.2d 143, 146-47 (D.C. Cir. 1985) (quoting 42 U.S.C. § 4332(C)). That analysis, "known as an 'Environmental Impact Statement,'" must "include such considerations as 'the environmental impact of the proposed action,' 'any adverse environmental effects which cannot be avoided should the proposal be implemented,' and 'alternatives to the proposed action.'" *Id.* (quoting 42 U.S.C. § 4332(C)).

In keeping with Congress's concern with "unplanned and unforeseen consequences," S. Rep. No. 91-296, at 79 (1969), *reprinted in* 1969 U.S.C.C.A.N. 2751, NEPA regulations require agencies to look beyond the immediate, near-term impacts of a proposed action and consider "indirect effects." Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable," such as "growth inducing effects and other effects related to induced changes … and related effects on air and water and other natural systems." 40 C.F.R. § 1508.8(b). An agency cannot focus narrowly on the single action under consideration, but must also examine the "cumulative effects" of its proposed action—"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions." 40 C.F.R. § 1508.7. NEPA thereby assures that agencies consider effects that result from "individually minor but collectively significant actions taking place over a period of time." *Id. See Delaware Riverkeeper*, 753 F.3d at 1319-20.

In assessing these impacts, agencies must engage in "reasonable forecasting and speculation." *Delaware Riverkeeper Network*, 753 F.3d at 1310 (quoting *Scientists' Inst. for Pub. Info.*, 481 F.2d at 1092) (modification omitted). Where information is essential to the agency's assessment, the agency must include it in the EIS unless "the overall costs of obtaining it are … exorbitant." 40 C.F.R. § 1502.22(a). Where "the means to obtain" information relevant to a project's impacts "are not known," the agency must nonetheless make a best effort to evaluate the impacts "based upon theoretical approaches or research methods generally accepted in the scientific community." *Id.* § 1502.22(b).

These various procedural requirements have "twin aims": to ensure that the agency's decisions are fully informed, by placing "upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action"; and to make certain that the public is aware of agency decisions and their consequences, by providing "that the agency will inform the public that it has indeed considered environmental concerns in its decisionmaking." *Baltimore Gas & Elec. Co. v. Natural Res. Def. Council*, 462 U.S. 87, 97 (1983).

1. NEPA Procedures for LNG Export

Where multiple federal agencies have authority over different aspects of the same project, agencies may coordinate review, and may incorporate one another's analysis. 40 C.F.R §§ 1501.5, 1501.6, 1506.2, 1506.3. For LNG projects, DOE's longstanding practice has been for FERC to act as the lead NEPA agency. DOE, Import and Export of Natural Gas; New Administrative Procedures; Proposed Rule, 46 Fed. Reg. 44,696, 44,700 (Sept. 4, 1981). Although NEPA regulations permit DOE to adopt an EIS prepared by FERC, DOE can only do so after independently ensuring that the EIS satisfies DOE's NEPA obligations. 40 C.F.R. § 1506.3(c). *See, e.g., Sierra Club v. Army Corps of Engineers*, 295 F.3d 1209, 1223 (11th Cir. 2002) (holding that an agency must undertake "independent consideration" before adopting EIS prepared by another agency).

At times relevant here, DOE's practice was to consider non-environmental issues before any NEPA review, and, if warranted, issue an authorization that was "conditioned" on future NEPA review. 46 Fed. Reg. at 44,700. After FERC completed NEPA review, DOE would determine whether to adopt FERC's EIS and whether to finalize the conditional authorization. *Id.*

III. United States Natural Gas Exports and the Freeport Proposal

United States natural gas production increased substantially over the past decade, in large part due to the development of "hydraulic fracturing" drilling techniques. *See* 80 Fed. Reg. 18,557, 18,559 (Apr. 7, 2015) (noting that as a result of these developments United States' natural gas production has reached its highest level in 30 years). Advances in drilling technology have allowed natural gas supplies to outpace demand in the United States, and prices have therefore remained low.

This situation persists in part because the United States natural gas market is not well connected to the rest of the world, as North America historically lacked the industrial facilities required to liquefy gas for overseas export. EIA Export Study at 3, JA____. Low natural gas prices in the United States have, consequently, contrasted sharply with high prices abroad. The EIA explained in 2011 that "current natural gas markets [were] not integrated globally," such that "prices span[ned] a range from ... $4 per MMbtu[3] in the United States" to "$16 per MMbtu in Asian markets" *Id.*

A. Freeport's Export Application

Stretching from 2010 through today, many companies have sought to capitalize on this disparity between U.S. and global gas prices and supply. When environmental review of the Freeport project was underway, DOE had already received applications for more than 13 trillion cubic feet per year[4] of exports to non-free trade agreement nations, amounting to nearly half of *all* natural gas produced in the United States. DOE, Applications Received by DOE/FE To Export Domestically Produced LNG from the Lower-48 States (as of March 24, 2014), JA____; EIA, Natural Gas Withdrawals and Production (Feb. 29, 2016),[5] ("Gas Production Totals") (calculating 2013 production at 29.5 trillion cubic feet).

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[3] "MMBtu" denotes a million British thermal units, a measure of the energy capacity of a fuel.

The Freeport application was one of the first of these applications. In 2011, Freeport filed the application at issue in this case, seeking authorization under Section 3(a) of the Natural Gas Act, 15 U.S.C. § 717b(a), to export 511 billion cubic feet per year ("bcf/y") of natural gas to "non-free trade agreement" countries.[6] Freeport LNG Expansion, LP, *et al.*, Application for Long-Term Authorization to Export Liquefied Natural Gas to Non-Free Trade Agreement Countries, Dk. 11-161-LNG (Dec. 19, 2011), JA____ ("Application"). This application built upon another 511 bcf/y application Freeport filed in 2010. *See* Conditional Authorization at 1, JA____ (summarizing Freeport's prior application).

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[4] In this brief, Sierra Club discusses gas volumes in cubic feet per year. Documents in the record use both annual and daily volumes.

[5] https://www.eia.gov/dnav/ng/ng_prod_sum_a_EPG0_FGW_mmcf_a.htm

[6] See note 2, *supra*.

Freeport argued in its application that although these exports would link U.S. markets with fierce international demand, they would minimally impact domestic gas prices, and therefore be consistent with the public interest, because exports would be supplied by increases in production, rather than by outbidding existing domestic gas consumers for a share of current domestic supply. Application at 17, JA____. Freeport relied, in part, on forecasts provided by a private consultant, Deloitte Marketpoint, which used sophisticated economic models to estimate the impacts of LNG exports. *Id.* (citing Deloitte Marketpoint, Made in America: The Economic Impact of LNG Exports from the United States, JA____).[7] Freeport contended that "Producers will anticipate" the demand created by exports "and bring more supplies online …. There will be ample notice and time in advance of exports to make supplies available." *Id.* at 20, JA____. Freeport further endorsed Deloitte's ability to predict where this additional production would occur. *Id.* at 24, JA____.

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[7] This Deloitte report considered aggregate impacts of 2,190 bcf/y of exports. Deloitte has also modeled the impact of a single export facility. Deloitte MarketPoint, Analysis of Economic Impact of LNG Exports from the United States, at 1, JA____ (modeling the impacts of Excelerate Energy's Lavaca Bay, Texas, export proposal).

Freeport further argued that inducement of additional gas production would be the primary economic benefit of the proposed exports. Freeport stated that its proposed exports would "provide the Gulf Coast region and the United States with significant economic benefits by increasing domestic natural gas production." *Id.* at 15, JA____. "The requested Export Authorization will allow the U.S. to benefit now from the natural gas resources that may not otherwise be produced for many decades, if ever." *Id.* "Between 17,000 and 21,000 *new* American jobs will be indirectly created by the *increase* in drilling for and production of natural gas required to support the Export Authorization." *Id.* at 16, JA____ (emphases added).

Sierra Club responded to this application with a timely motion to intervene and protest, raising each of the issues presented here. Sierra Club, Motion to Intervene and Protest (Apr. 14, 2012) at 11-36, JA____-____.

B. Procedural Overview

Freeport's application, together with similar export applications, kicked off a long series of export studies, NEPA environmental reviews, comments to both FERC and DOE, conditional approvals, and administrative protests. This section provides a condensed timeline of the principle events, which are more fully explained in the sections that follow.

As noted above, Freeport filed its application for this proposal with DOE in December 2011. Application, JA_____. The following month, the EIA released its first study on how U.S. energy production and markets would respond to exports. EIA Export Study, JA____. Later in 2012, DOE published a private consultant's report on how exports would affect the broader U.S. economy. NERA, Macroeconomic Impacts of LNG Exports from the United States (Dec. 3, 2012), JA___ ("NERA Study"). Relying on these two studies, DOE conditionally approved the Freeport exports at issue in this case, pending environmental review, in November 2013. Conditional Authorization, JA_____. In early 2014, FERC completed its NEPA review of the related Freeport infrastructure projects, releasing a draft EIS in March 2014 and the final EIS in June 2014. FERC, Freeport Liquefaction Project, Final EIS, CP12-509, (June 2014), ES-3, JA____ ("EIS") (summarizing issuance of draft and final EIS). Separate from this formal NEPA process, in 2014 DOE prepared an "Addendum to Environmental Review Documents" that discussed "potential environmental issues associated with unconventional gas production," which DOE released in conjunction with several reports from the National Energy Technology Laboratory. Addendum at 2, JA____. Sierra Club filed comments on the application, economic studies, NEPA review, and Addendum, as discussed below.

DOE granted final approval to Freeport's export application in November 2014. Authorization Order, JA____. Sierra Club sought rehearing, which DOE denied a year later, in December 2015. Sierra Club, Rehearing for Rehearing, Dkt. 11-161-LNG (Dec. 15, 2014) ("Rehearing Request"), JA____, DOE, Order 3357-C, Dkt. 11-161-LNG, *Opinion and Order Denying Request for Rehearing of Orders Granting Long-Term, Multi-Contract Authorization to Export Liquefied Natural Gas by Vessel from Freeport LNG Terminal on Quintana Island, Texas* *to Non-Free Trade Agreement Nations* (Dec. 4, 2015) ("Rehearing Order"), JA____.

C. First Round of LNG Export Studies

In response to Freeport's initial export application and three other similar applications, DOE commissioned a "two-part LNG Export Study." Authorization Order at 24, JA____.

The first part of this study was a report by the EIA analyzing the potential impact of LNG exports on energy consumption, production, and pricing. EIA Export Study, Appendix A, JA____. After conducting a detailed analysis using its well-developed modeling tools, the EIA concluded, *inter alia*, that: (1) "Increased natural gas exports lead to increased natural gas prices" within the United States; (2) "Natural gas markets in the United States balance in response … largely through increased natural gas production"; and (3) "Due to higher prices [of natural gas], the [U.S.] electric power sector primarily shifts to coal-fired generation." *Id.* at 6, JA____.

The EIA predicted approximately 63 percent of export-created demand would be met by additional gas production, and that most (over 70 percent) of this additional production would be derived from "shale gas" through hydraulic fracturing—a form of drilling which has especially severe environmental impacts. *Id.* at 10-11, JA_____-____. The Administration also published some of the modeling results it used to generate the EIA Export Study, which explained how the additional production would be divided among individual regions. EIA, Lower 48 Natural Gas Production and Wellhead Prices by Supply Region (Jan. 2012), JA____.[8] Numerous other studies, by private modelers, have affirmed the EIA Export Study's basic conclusions. *See* Deloitte Marketpoint, Made in America, at 10, JA____; Charles Ebinger *et. al.*, "Liquid Markets: Assessing the case for U.S. Exports of Liquefied Natural Gas," Brookings Institution (May 2012), at 32, JA____.

The EIA concluded that "most of the remainder" of export-created demand (*i.e.*, the 37% not met by increased production) would be satisfied by electric sector, as utilities shifting generation from gas to coal. EIA Export Study at 12, 18 JA____, _____. The Administration explained that this shift from gas to coal would increase U.S. emissions of carbon dioxide; the study provided quantitative estimates of the size of this increase in each export scenario.[9] *Id.* at 19, JA____.

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[8] This and other tables are easily viewed online at http://www.eia.gov/oiaf/aeo/tablebrowser/. Select "Effect of Increased Natural Gas Exports on Domestic Energy Markets" from the "Publication" menu.

This study was developed using the National Energy Modeling System, the Administration's core analytic tool. This system "projects the production, imports, conversion, consumption, and prices of energy." EIA, The National Energy Modeling System: An Overview, 1 (2009), JA____. It is used "to project the energy, economic, environmental, and security impacts on the United States of alternative energy policies and different assumptions about energy markets." *Id.* The system incorporates "a play-level[10] model that projects the crude oil and natural gas supply from the onshore lower 48 [states]." EIA, Documentation of the Oil and Gas Supply Module, 2-3 (2011), JA____.

The EIA Export Study was used as the input for a second study, a report by NERA consulting on the macroeconomic impacts of exports.

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[9] The EIA did not address the still further increase in greenhouse gas emissions that would result from methane emitted by the increased production of natural gas.

[10] A "play" is a geologic region containing oil or gas resources, such as the Marcellus Shale.

NERA Study, JA____. NERA concluded that exports would raise domestic gas prices, which would adversely affect American manufacturers, particularly in energy intensive industries, and which would depress "real wages" in all industries other than the gas sector. *Id.* at 7, JA___. NERA calculated that, in one representative scenario, exporting 4,380 bcf/y of gas in 2030[11] would decrease labor and investment income by $45 billion. *Id.* at 8, 188, JA____, ____. The decrease in labor income is the equivalent to 292,000 lost jobs. Synapse Energy Economics, *Will LNG Exports Benefit the United States Economy?*, 5 (Jan. 23, 2013), JA____.

Despite those job losses and other economic harms, NERA concluded that LNG exports would cause a net increase in gross domestic product, because of increased natural gas production and sale of gas to overseas buyers. NERA Study at 7, 188, JA____, ____. In the above-described scenario, NERA predicted a 0.05 percent, or $11.4 billion, increase in 2030 gross domestic product. *Id.* These benefits, however, accrued only to the companies producing and exporting natural gas and their shareholders. *Id.* at 2, 13, JA____, ____.

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[11] The highest amount considered in EIA's 2011 Export Study.

D. DOE's Conditional Authorization

DOE issued a "conditional authorization" for the application at issue here on November 15, 2013. Conditional Authorization, JA____. In doing so, DOE reviewed the application, Sierra Club's protest, the EIA and NERA studies, and the comments thereon. DOE did not discuss any environmental issues, but nonetheless concluded that the proposed exports were consistent with the public interest. DOE authorized the proposed project to export 146 bcf/y for a 20-year term, "subject to satisfactory completion of environmental review." Conditional Authorization at 7, JA____.

DOE's's public interest analysis concluded that exports would not cause harmful gas price increases because the U.S. market would be able to respond by increasing production, thus reducing competition between exports and existing demand for gas supplies. *Id.* at 136-137, JA____. DOE found that the "LNG Export Study [was] fundamentally sound," and supported the conclusion that "the United States will experience net economic benefits from issuance of authorizations to export domestically produced LNG." *Id.* at 153, JA____.

Nonetheless, DOE narrowed the scope of the requested authorization from 511 to 146 bcf/y. *Id.* at 7, JA____.[12] DOE explained that it had already approved Freeport's earlier application for 511 bcf/y, and that Freeport's application to FERC, discussed below, sought authorization to construct a facility with only 657 bcf/y of capacity. Conditional Authorization at 7, JA____. DOE found "no basis … to authorize exports in a volume greater than the Project's maximum liquefaction capacity." *Id.*

On this basis, DOE authorized exports "conditioned on [Freeport's] satisfactory completion of the environmental review process." *Id* at 163, JA____. DOE explained that "the issues addressed herein regarding the export of natural gas will be reexamined at the time of DOE/FE's review of the FERC environmental analysis." *Id.*

[12] DOE also reduced the term from the requested 25 years to 20. Conditional Authorization at 157, JA____.

E. FERC's NEPA Review

In parallel with Freeport's applications to DOE, related Freeport entities applied to FERC for authorization to construct and operate the infrastructure necessary to liquefy natural gas and load it onto tankers for export.[13] FERC undertook NEPA review of the project, with DOE acting as a cooperating agency. EIS at ES-1, JA____. Sierra Club submitted timely and extensive comments on the draft, arguing, *inter alia*, that NEPA required FERC to consider the indirect effects that the proposed exports would cause by increasing U.S. gas production, increasing U.S. coal use, and from the combustion of exported LNG in end-use markets. Sierra Club, Comments on EIS, (May 5, 2014) at 23, JA____. Sierra Club argued that the EIS must consider both the effects of the individual Freeport project on these three domains, and the cumulative effects of other U.S. LNG export proposals.

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[13] Although Freeport's requests to DOE for export authorization are split between two applications, Freeport filed only a single application with FERC.

FERC released its final EIS for the project on June 16, 2014. EIS, JA____. FERC refused to consider any of these issues. As to increased gas production, the only discussion found in the body of the EIS was a single paragraph, which stated:

> We do not consider impacts from induced production and pipeline transportation associated with additional shale gas development as "reasonably foreseeable". There is no specific shale-gas play that has been identified as a source of natural gas and the proposed Project does not depend on additional shale gas production. In addition, shale gas production has occurred for reasons unrelated to the Project and over which the Commission has no control, such as state permitting for additional gas wells. Thus cumulative impacts from shale gas production have not been addressed in this EIS.

EIS at 4-240, JA____. The only other discussion of this issue in FERC's EIS appears in Appendix L, which concluded that it was impossible to predict "if" exports would increase shale gas production. EIS Appendix L-189, JA____. FERC responded to Sierra Club's argument regarding increased coal use by stating that "DOE has exclusive jurisdiction over the export of natural gas as a commodity. Consequently, consideration of impacts related to increased exports of LNG are not included in the

Freeport LNG EIS." EIS Appendix L-216, JA____. Finally, regarding effects of consuming LNG in end-use markets, the EIS stated:

> The FERC also does not evaluate end user cumulative impacts of the LNG exports as it is not possible to know who those end users would be, or for the FERC to realistically be able to characterize those impacts (especially in foreign countries, where environmental constraints would be different from the U.S. permitting process). Thus determining the end users and associated impacts is not reasonably foreseeable.

EIS 4-240 – 4-241, JA____-____.

F. Environmental Addendum

Shortly before FERC released the final EIS for the Freeport project, DOE published a "Draft Addendum to Environmental Review Documents Concerning Exports of Natural Gas from the United States." 79 Fed. Reg. 32,258 (June 4, 2014). DOE explained that the Addendum was intended "to provide the public with a more complete understanding of … the potential environmental impacts associated with unconventional natural gas production in the lower-48 states." *Id.* at 35,359.

DOE published the Draft Addendum simultaneously with three reports by the National Energy Technology Laboratory. The Addendum directly relies on one of these reports: Nat'l Energy Tech. Lab., *Environmental Impacts of Unconventional Natural Gas Development and Production* (May 29, 2014) ("Unconventional Production Report"), JA____. DOE provided separate notice of the availability of the second report: the Global Life Cycle Report, JA_____. *See* 79 Fed. Reg. 32,260 (June 4, 2014). This second report assesses the 'life cycle'—well head to power plant—greenhouse gas emissions associated with electricity generated using U.S. LNG in Europe or Asia, and compares these with emissions from electricity generated from coal or other sources of gas.

These two reports, in turn, each cite a third: National Energy Technology Laboratory, Life Cycle Analysis of Natural Gas Extraction and Power Generation (May 29, 2014) ("Domestic Life Cycle Report"), JA____. This report differs from the LCA GHG Report by discussing air pollutants other than greenhouse gases, as well as non-air-pollution impacts, and by not discussing natural gas liquefaction, trade, or international effects.

After receiving public comments, DOE released the final Addendum on August 15, 2014. Addendum, JA_____. The Addendum and related reports recognize that natural gas production has many harmful environmental impacts. Natural gas is mostly methane, a greenhouse gas many times more potent than carbon dioxide. *Id.* at 21, JA_____. When gas is extracted, processed, and transported, some of that methane is released into the atmosphere. *Id.* These activities also emit other greenhouse gases, primarily from equipment operation. *Id.* at 23, JA____. These activities also produce nitrogen oxides and volatile organic compounds, which lead to ground-level ozone pollution, as well as other air pollutants. *Id.* at 20, JA____. The Addendum recognized that natural gas production is the primary contributor to ozone problems in some areas. *Id.* at 28, JA____. Natural gas production, especially hydraulic fracturing, impacts water resources both by requiring millions of gallons of water per well and by producing large volumes of wastewater that are difficult to manage. *Id.* at 10-18, JA____-____. Natural gas drilling and related infrastructure also impact landscapes and fragment habitat. *See, e.g., id.* at 65-65, JA____-____.

Although the final Addendum included a response to comments, it did not resolve the fundamental defect Sierra Club identified: the Addendum "does not," in DOE's words, "attempt to identify or characterize the incremental environmental impacts that would result from LNG exports." Authorization Order at 84, JA____. For example, although the Addendum recognizes that exports will increase gas production, Addendum at 1, JA____, and that gas production emits numerous air pollutants, the Addendum provides no analysis of the amount of additional production-related pollution that would result from any volume of exports.

DOE did not argue that the Addendum was part of its NEPA analysis; instead, it stated that "By including this discussion of natural gas production activities, [DOE] is going beyond what NEPA requires." 79 Fed. Reg. at 35,359. DOE similarly stated that "the [Global Life Cycle] Report does not fulfill any NEPA requirements in [the Freeport] proceeding, nor has DOE made any suggestion to that effect." Authorization Order at 82, JA____.

G. Updated LNG Export Study

On the same day that the draft Addendum and NETL studies were released, DOE also requested an update to the EIA Export Study. EIA, Effect of Increased Levels of Liquefied Natural Gas Exports on U.S. Energy Markets, Appendix A (Oct. 29, 2014), JA_____ (letter requesting update). The EIA completed this update in October 2014. *Id.* at 1, JA____.

Rather than revisit the export volumes analyzed in the initial study, the update started with the baseline level of exports the Administration predicted in its 2014 Annual Energy Outlook, 3,500 bcf/y. *Id.* at 13, JA____; *see also* EIA, Annual Energy Outlook 2014, MT-24 (April 2014), JA____. The update modeled the incremental impact of increasing exports from this level to 4,380, 5,840, or 7,300 bcf/y. Updated EIA Export Study at 13, JA____. The update nonetheless affirmed the basic conclusions of initial study. The Administration again concluded that "[i]ncreased LNG exports lead to increased gas prices," "[n]atural gas markets in the United States balance in response to increased LNG exports mainly through increased natural gas production," and "[a]cross the different export scenarios and baselines, higher natural gas production satisfies about 61% to 84% of the increase in natural gas demand from LNG exports," with "about three-quarters of this increased production [coming] from shale sources." *Id.* at 12.

The update further confirmed that increasing exports would cause "fuel switching in the electric power sector," including an increase in coal use, *id.*, as utilities responded to higher gas prices by shifting generation from gas to coal. The Administration reaffirmed that this shift to coal would contribute to an increase in U.S. carbon dioxide emissions. *Id.* The update found that these effects would still occur, albeit to a lesser extent, in the "accelerated coal and nuclear retirement" scenario included in the model. *Id.* at 5, Table B2, JA____, _____.

H. Authorization of Freeport's Exports and Denial of Rehearing

DOE authorized the Freeport exports on November 15, 2014. Authorization Order, JA____. Sierra Club filed a timely request for rehearing. Rehearing Request, JA____. Nearly a year later, DOE took final action on this request, denying it on December 4, 2015. Rehearing Order, JA____. Sierra Club petitioned this Court for review.

IV. U.S. Climate Policy

The rush to export LNG from the United States has coincided with development of federal plans and commitments to combat climate change by reducing greenhouse gas emissions. As the President explained in June 2013 (before the environmental review at issue in this case), climate change will have "far-reaching consequences and real economic costs." Executive Office of the President, The President's Climate Action Plan (June 2013) ("Climate Action Plan") at 4-5, JA____-____. Accordingly, the President "put[] forward a broad-based plan to cut the … pollution that causes climate change and affects public health." *Id.* Part of this plan reiterated previous international commitments to reduce U.S. greenhouse gas emissions, relative to 2005, by at least 17 percent by 2020, 42 percent by 2030, and 83 percent by 2050. United States Framework Convention on Climate Change, Annex I (June 7, 2011), JA____.

The federal government has begun to implement the Climate Action Plan by embarking on an effort to reduce greenhouse gas emissions from the electric sector, principally coal-fired power plants. In 2014, Environmental Protection Agency ("EPA") proposed rules to limit carbon dioxide emissions from new and existing power plants. These rules rely, in part, on switching from coal to low-priced natural gas. *See e.g.,* 79 Fed. Reg. 34,830, 34,862 (June 19, 2014). EPA estimates that this rule will reduce emissions by 415 million tons of carbon dioxide equivalent per year. Regulatory Impact Analysis for the Clean Power Plan Final Rule, ES-6 (Oct. 23, 2015).[14]

The President has recognized, however, that the U.S.'s climate goals cannot be achieved by changes in the electric sector alone. The Climate Action Plan stated that "[c]urbing emissions of methane is critical to [the nation's] overall effort to address global climate change," and identified "oil and gas development" as one of the "sectors in which methane emissions can be reduced." Climate Action Plan at 10, JA____. On January 14, 2015, the President stated a concrete goal for methane reduction: "to cut methane emissions from the oil and gas sector by 40 – 45 percent from 2012 levels by 2025." White House, *Fact Sheet: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions* (Jan 15, 2015).[15]

The President has also recognized that "ultimately, if we're going to prevent large parts of this Earth from becoming not only inhospitable but uninhabitable in our lifetimes, we're going to have to keep some fossil fuels in the ground rather than burn them and release more dangerous pollution into the sky." Statement by the President on the Keystone XL Pipeline (Nov. 6, 2015).[16] The President stated that "America is now a global leader when it comes to taking serious action to fight climate change. And frankly, approving" the Keystone XL pipeline, an infrastructure project that would have linked otherwise isolated fossil fuel supplies with a potential market, "would have undercut that global leadership." *Id.*

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[14] https://www.epa.gov/sites/production/ files/2015-08/ documents/cpp-final-rule-ria.pdf

[15] https://www.whitehouse.gov/the-press-office/2015/01/14/fact-sheet-administration-takes-steps-forward-climate-action-plan-anno-1

SUMMARY OF ARGUMENT

DOE violated NEPA by failing to take a hard look at the indirect effects of LNG exports, including both the effect of the specific exports proposed here and the cumulative effects of other pending and approved export proposals.

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[16] https://www.whitehouse.gov/the-press-office/2015/11/06/statement-president-keystone-xl-pipeline

The LNG export application at issue here is one of many before DOE. NEPA required DOE to consider the effects of this application as well as the cumulative effect of other exports. Here, DOE violated NEPA by concluding that the environmental impacts of exports were not foreseeable because DOE could not "guarantee" the authorized exports would actually occur. Part II.A.

The record demonstrates that LNG exports will increase U.S. gas production, increase the amount of coal burned by U.S. electric utilities, and increase natural gas use in the countries that import U.S. LNG. DOE violated NEPA by approving the project without taking a hard look at the environmental effects of these increases. Part II.B. There is a "reasonably close causal relationship" between exports and each of these increases, as demonstrated by, *inter alia*, the studies DOE relied upon for its economic analysis. Part II.C. The record establishes that the environmental impacts of these increases can be foreseen and meaningfully discussed. Part II.D.

Finally, DOE's assessment of the public interest, pursuant to Natural Gas Act, was arbitrary and capricious. DOE concluded that exports would cause environmental harm, but that other benefits outweighed this harm. Because DOE failed to provide any discussion of the magnitude of this harm, DOE's conclusion that it would be outweighed by non-environmental benefits had no rational basis. Part III.

STANDING

Sierra Club is a national environmental organization, whose members live, work, and recreate in the vicinity of the Freeport liquefaction terminal, pretreatment plant, and associated pipeline infrastructure. Declaration of Melanie Oldham ¶¶ 2, 6-7 (March 15, 2016), Declaration of Michael Hershey (March 9, 2015). Operation of these facilities depends, in part, on the DOE order challenged here; if the volume of authorized exports is curtailed, this will reduce the hours or intensity of operation of liquefaction equipment, the pretreatment facility, vessel loading, and vessel traffic. All of this will reduce air, noise, and light pollution, and thus reduce Sierra Club's members' injuries. Oldham Decl. ¶¶ 10-15; *Friends of the Earth, Inc. v. Laidlaw Envtl. Servs. (TOC)*, 528 U.S. 167, 183 (2000); *Ass'n of Battery Recyclers v. EPA,* 716 F.3d 667, 672-73 (D.C. Cir. 2013).

These injuries "follow[] from [the] inadequate FEIS," including the failure to adequately consider indirect impacts relating to gas consumption and electricity production. *WildEarth Guardians v. Jewell*, 738 F.3d 298, 307 (D.C. Cir. 2013). A decision by this Court vacating DOE's order for failure to comply with NEPA would redress these injuries "regardless [of] whether the FEIS's specific flaw relates to local or global environmental impacts." *Id.*; *see also Lujan v. Defenders of Wildlife*, 504 U.S. 555, 572 n.7 (1992) (redressability requirement relaxed for procedural injuries). Sierra Club has organizational standing to proceed on these members' behalf. *Hunt v. Wash. State Apple Adver. Comm'n*, 432 U.S. 333, 343 (1977).

ARGUMENT

I. STANDARD OF REVIEW

Under the Natural Gas Act's judicial review provision, 15 U.S.C. § 717r(b), DOE's decision "will be set aside as arbitrary and capricious if it is not the product of reasoned decisionmaking." *Del. Riverkeeper Network*, 753 F.3d at 1313 (internal quotations omitted). The court must determine whether the agency has "examine[d] the relevant data and articulate[d] a satisfactory explanation for its action including a rational connection between the facts found and the choices made." *Motor Vehicle Mfrs. Ass'n of U.S., Inc. v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (internal quotation marks omitted). "[A]gency action … can be upheld only on the basis of a contemporaneous justification by the agency itself, not *post hoc* explanation of counsel." *N. Air Cargo v. U.S. Postal Serv.*, 674 F.3d 852, 860 (D.C. Cir. 2012).

II. NEPA

NEPA prohibits DOE from authorizing exports without informing itself and the public, in an environmental impact statement, of the reasonably foreseeable indirect and cumulative effects of such exports. DOE is reviewing export applications amounting to a significant percentage of all gas produced in the United States. The EIA predicts that, if authorized, many export facilities will be built and enter operation. The EIA Export Study, Addendum, and other materials in the record demonstrate that DOE has the tools to analyze the indirect effects of these exports. However, DOE refused to use these available tools, and instead approved the Freeport exports without providing any analysis of the incremental impact of the additional gas production or other effects that would result from these exports, or from exports cumulatively. DOE's assertions that doing so would be impossible or unduly burdensome are not supported by the law or the record in this case.

A. DOE Cannot Reasonably Contend that Authorizing Exports Will Not Foreseeably Lead to Exports

DOE argues, first, that the "environmental impacts" of "exports … are not reasonably foreseeable" because "[r]eceiving … authorization from [DOE] does not *guarantee* that a particular facility would be financed and built; nor does it *guarantee* that, if built, market conditions would continue to favor export." Authorization Order at 84, JA____ (emphases added).

DOE cannot contend that the 146 bcf/y of exports authorized by the order challenged here are themselves unforeseeable. The action authorized by an agency is, tautologically, a foreseeable consequence of that authorization. An effect is reasonably foreseeable if it is "'sufficiently likely to occur that a person of ordinary prudence would take it into account in reaching a decision.'" *City of Shoreacres v.*

Waterworth, 420 F.3d 440, 453 (5th Cir. 2005) (quoting *Sierra Club v. Marsh,* 976 F.2d 763, 767 (1st Cir. 1992)); *accord Mid States Coal. for Progress v. Surface Transp. Bd.,* 345 F.3d 520, 549 (8th Cir. 2003). A person of ordinary prudence, in deciding whether to authorize an action, would obviously consider the possibility of that action occurring.

Nor can DOE contend that exports beyond those authorized in this particular order are unforeseeable. NEPA compels DOE to analyze the "cumulative" effects" that "result[] from the incremental impact of [agency] action when added to other past, present, and reasonably foreseeable future actions." 40 C.F.R. § 1508.7. DOE has recognized that its approval of the many export requests before it would pose significant cumulative impacts, as reflected in DOE's request for programmatic studies of exports' effect on United States gas supply and the economy.

DOE declined to provide comparable review of environmental impacts, however, contending that, because authorization does not "guarantee" that exports will occur, there is "uncertainty as to the aggregate quantity of natural gas that ultimately may be exported." Authorization Order at 84, JA____; *see also* Rehearing Order at 17, JA___. But uncertainty is inherent in all predictions of future events. NEPA requires "reasonable forecasting and speculation" in determining what is reasonably foreseeable. *Del. Riverkeeper Network*, 753 F.3d at 1310 (quoting *Scientists' Inst. for Pub. Info., Inc.*, 481 F.2d at 1092) (modification omitted). Here, DOE should have provided environmental review that paralleled its scope of economic review, considering volumes between 2,190 and 7,300 bcf/y of gas. EIA Export Study, Appendix A, JA____; Updated EIA Export Study, Appendix A, JA_____.

Such broad review is appropriate because a person of ordinary prudence considers the possibility of events other than those most likely to occur. *See Sierra Club v. Watkins*, 808 F. Supp. 852, 868 (D.D.C. 1991) (holding NEPA requires analysis of even "low probability" risks). Nonetheless, the record indicates that, if DOE authorizes them, exports of more than ten percent of U.S. gas production are likely to occur. Months before finalization of the EIS at issue here, DOE had already granted conditional or final approval for 3,387 bcf/y worth of export applications. DOE, Applications Received by DOE/FE To Export Domestically Produced LNG from the Lower-48 States (as of March 24, 2014), JA____. After the EIS was issued, but more than three months before the Authorization Order, DOE conditionally approved another application, bringing the total to 3,844.[17] FERC, meanwhile, had authorized or was actively reviewing applications for export infrastructure with at least 3,905 bcf/y of capacity.[18] These levels of export are plainly foreseeable, but were wholly ignored in the EIS.

Moreover, the EIA has concluded that 3,500 bcf/y of exports are likely to actually occur. DOE's Addendum observed that the Annual Energy Outlook for 2014 predicted that the U.S. would export 3,500 bcf/y from 2029 through 2040. Addendum at 43, JA____. The Authorization Order "note[d] that EIA's most recent projections …

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[17] *See* DOE, LNG Development Company, LLC, Order 3465 (July 31, 2014), available at http://www.fossil.energy.gov/programs/gasregulation/authorizations/2012_applications/oregon_lng_12-77-LNG.html.

[18] *See* FERC had issued two authorizations and one draft EIS for a project not yet authorized, and FERC was in the process of reviewing four other applications. Sabine Pass Liquefaction, 139 FERC ¶ 61,039 (2012) and 146 FERC ¶ 61,117 (Feb. 20, 2012) (together, 1,007 bcf/y); Cameron LNG, 79 Fed. Reg. 3,197 (Jan. 17, 2014) (draft EIS for 621 bcf/y); Corpus Christi Liquefaction, 77 Fed. Reg. 58,368 (Sept. 20, 2012) (767 bcf/y); Dominion Cove Point LNG, 78 Fed. Reg. 23,552 (Apr. 19, 2013) (281 bcf/y); Jordan Cove Energy Project, 78 Fed. Reg. 34,089 (June 6, 2013) (292 bcf/y); LNG Development Company (d/b/a Oregon LNG), 78 Fed. Reg. 38,703 (June 27, 2013) (331 bcf/y); Sabine Pass Liquefaction Expansion, 78 Fed. Reg. 62,344 (Oct. 18, 2013) (504 bcf/y).

continue to show market conditions that will accommodate increased exports of natural gas." Authorization Order at 95, JA____.

B. DOE's Refusal to Consider the Indirect Effects of Export-Driven Changes in Gas Production and Use Violated NEPA

NEPA requires agencies to consider and disclose the "indirect effects" of their actions, 40 C.F.R. § 1508.8(b). Indirect effects are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable." *Id.* These encompass both "growth inducing" and "economic" effects, including "induced changes in the pattern of land use, population density or growth rate." *Id.*

The record clearly establishes that exports—both those authorized in this order, and cumulatively—will have important indirect effects. The gas to be exported will come from somewhere. The record demonstrates that, overall, U.S. markets will balance primarily by increasing production and, secondarily, reducing competing gas demand through an incremental shift from gas to coal use in the U.S. electric power sector. EIA Export Study at 6, JA____; Addendum at 1, JA____.

Once liquefied natural gas is exported, it will inevitably be transported by tanker, re-gasified, distributed to end users via pipeline, and burned.

Courts have consistently required that agencies' NEPA analyses address effects like these. The Eighth Circuit has addressed closely parallel circumstances, holding that when an agency approves a rail-line extension that would result in "an increase in availability and a decrease in price" of coal, NEPA demands that the agency examine the environmental "effects that may occur as a result of the reasonably foreseeable increase in coal consumption." *Mid States,* 345 F.3d at 549-50. Specifically, *Mid States* required the agency to use available tools to assess the impact this additional coal combustion would have on air quality. *Id*. Other Circuits have similarly held that where a project will increase an activity by enabling it to occur or by making the activity more economically attractive, NEPA requires analysis of the effects of the activity's increase. *Barnes v. U.S. Dep't of Transp.*, 655 F.3d 1124, 1138-9 (9th Cir. 2011) (requiring study of increased air traffic spurred by new airport runway); *Sierra Club v. Marsh*, 769 F.2d 868, 877-79 (1st Cir. 1985) (requiring consideration of effects of "industrial development" of previously undeveloped and inaccessible island that would be enabled by new port and causeway). In particular, where "[t]he growth-inducing effects of … [a] project are its raison d'etre," that growth must be considered in the NEPA analysis, regardless of whether it is uncertain or depends on further "local and private action." *City of Davis v. Coleman*, 521 F.2d 661, 675, 677 (9th Cir. 1975) (requiring consideration of development enabled by highway project). *Friends of the Earth v. U.S. Army Corps of Eng'rs*, 109 F. Supp. 2d 30, 41 (D.D.C. 2000) ("Since the economic development of these areas is an announced goal and anticipated consequence of the casino projects, the Corps cannot claim that the prospect of secondary development is 'highly speculative.'"). In most cases, the agency will not have direct regulatory authority over the "indirect" effects of its action (especially "growth inducing" effects), but this fact does not remove effects from the scope of NEPA review. *See Sierra Club v. Army Corps of Engineers*, 803 F.3d 31, 40 n.3 (D.C. Cir. 2015) (Army Corps of Engineers could not confine its NEPA analysis to effects in "jurisdictional waters").

Here, DOE's NEPA analysis provided no discussion whatsoever of the indirect effects of supplying gas to be exported, or the effects of transporting and using that gas overseas. DOE adopted the EIS prepared by FERC without modification. Record of Decision, 79 Fed. Reg. 69,101 (Nov. 20, 2014), JA____. That EIS did not disclose to the public or decisionmakers the environmental effects of the incremental increases in gas production or coal use that would result from exports. EIS at 4-240, J-216, JA____, ____. Nor did the EIS provide any analysis of the impacts of using exported gas. EIS at 4-240 to 4-241, JA____-____.

Nor does the Addendum provide the required analysis. As Sierra Club explained in its request for rehearing, the Addendum is not a substitute for NEPA review. Rehearing Request 4-5, JA____-_____. The Rehearing Order did not argue that the Addendum played any role in satisfying DOE's NEPA obligations.

DOE argues that the Addendum nonetheless "inform[s]" DOE's "consideration of the effects of the proposal," insofar as the Addendum describes "how unconventional gas production impacts various resource areas and, where relevant, how those impacts vary geographically." Rehearing Order at 22, JA____. This argument does not address DOE's obligation to consider the impacts of increased coal use or combustion of exported gas. Even as to increased domestic gas production, providing material that could inform an analysis is not a substitute for the NEPA obligation to provide the analysis itself. The Addendum provides no analysis of the extent to which exports will lead to additional gas production (unconventional or conventional), much less an analysis of the environmental impacts caused by any particular volume of additional production. As DOE recognizes, the Addendum "addresses unconventional natural gas production in the nation as a whole"; it "does not attempt to identify or characterize the incremental environmental impacts that would result from LNG exports." Authorization Order at 84, JA____.

C. DOE Arbitrarily Refused to Use the Tools Underlying Its Economic Analysis to Inform Its NEPA Analysis

The Rehearing Order concluded that DOE was not required to consider these indirect effects because they do not bear "a reasonably close causal relationship" to DOE's authorization of exports. Rehearing Order at 14, JA____ (quoting *Dep't of Transp. v. Pub. Citizen*, 541 U.S. 752, 770 (2004)). The Rehearing Order does not, however, address the actual analysis or holding of *Public Citizen*: that an agency is not a "legally relevant 'cause'" of an environmental effect where the agency has "no ability" to prevent the effect. *Public Citizen*, 541 U.S. at 766,

770. Here, DOE plainly has such authority. DOE seeks to expand *Public Citizen* beyond its facts by arguing that effects on gas production, *etc.*, must be excluded to maintain a "'manageable'" scope of NEPA review. Rehearing Order at 14, JA____ (quoting *Public Citizen*, 541 U.S. at 767), 19, JA____ (complaining of "unreasonable and unrealistic burden[s]"). But requiring DOE to use the EIA Export Study and similar tools, which already inform DOE's economic analysis, to inform environmental review would not be an unmanageable or unrealistic burden.

Public Citizen concerned facts starkly different than those here: a situation where Congress had left the agency with no discretion to refrain from publishing a rule that would be a but-for cause of the environmental impacts at issue. *Public Citizen*, 541 U.S. at 768-70. Because there was no authority to withhold the rule, there was, in essence, no decision to be made. *Id.* Accordingly, analyzing the impacts of the emissions at issue would not fulfill NEPA's purpose of informing agency decisionmaking. *Id.*

Here, Congress has taken the opposite tack, instructing DOE to analyze the effects of LNG exports on natural gas supply and the environment in determining whether exports are consistent with the "public interest," and to disapprove of export if they are not. *NAACP*, 425 U.S. at 670; *Myersville Citizens for a Rural Cmty.,* 783 F.3d at 1307. DOE has the authority to deny the export application at issue here. Doing so would prevent the harms that would be caused by incremental gas production, increased coal use, and combustion of LNG overseas.

DOE has the authority to prevent these effects, and a NEPA obligation to consider them, even though states, local governments, and other federal agencies, unlike DOE, directly "regulate the environmental effects of natural gas production." Rehearing Order at 19, JA____. As this Court has explained, NEPA would "wither away in disuse, [if] applied only to those environmental issues wholly unregulated by any other federal, state or regional body." *Calvert Cliffs' Coordinating Committee, Inc. v. U.S. Atomic Energy Comm'n*, 449 F.2d 1109, 1122-23 (D.C. Cir. 1971). DOE's NEPA obligations are not reduced where Congress "grant[ed]" overlapping authority to another entity, but only where Congress has "limit[ed]" DOE's authority. *Public Citizen*, 541 U.S. at 769.

The Rehearing Order argues that the relationship between exports and the impacts of increase gas production is not "reasonably close" because it is not "proximate," Rehearing Order at 19, JA____, but *Public Citizen* did not import proximate cause doctrine into NEPA. Proximate causation, which determines whether a person is sufficiently at fault for an existing harm that the person should be legally liable for it, *CSX Transp., Inc. v. McBride*, 131 S. Ct. 2630, 2637 (2011), provides a useful "analog[y]" for explaining why NEPA should not be interpreted to require analysis of effects that the agency cannot prevent, *Public Citizen*, 541 U.S. at 767, 770 (citing *Metro. Edison Co. v. People Against Nuclear Energy*, 460 U.S. 766, 774 (1983)), or issues that are not effects on the physical environment, *Metro. Edison*, 460 U.S. at 774. Outside of these circumstances, the doctrine is a poor fit for the "policies [and] legislative intent" underlying NEPA, *Public Citizen*, 541 U.S. at 767, which serves to inform decisionmaking by identifying prospective impacts before they occur and, thus, while they can still be avoided. *See* 40 C.F.R. § 1502.2. Notably, NEPA does not specify a proximate causation requirement. 40 C.F.R. § 1508.8(b). In this situation, courts should not impose "judge-made proximate-cause formulations;"

requiring reasonable foreseeability suffices to avoid finding causation in unintended "far out" scenarios. *McBride*, 131 S. Ct. at 2643.

Although proximate causation is not the test for NEPA applicability, it is satisfied here in any event. *See* Restatement (Second) of Torts §§ 440-443 (1965) (a person bears responsibility for the "normal consequence" of his actions, regardless of whether a link in the chain of events is a third party acting predictably). An increase in gas production is both foreseeable and a "normal consequence" of the action here; Freeport identifies it as the primary benefit of exports. Application at 15-16, JA____-____.

Rather than invoke the specific facts at issue in *Public Citizen*, DOE broadly argues that analyzing impacts on production "in every [gas] producing region in the country" and on the "level of coal generation in the United States" would impose an "unreasonable" and "[un]manageable" burden. Rehearing Order at 19, 23, JA____, ____.

DOE's assertion that assessing the impacts of natural gas exports on gas production and coal consumption would be unreasonably burdensome is belied by the fact that the EIA has already performed this assessment. EIA Export Study at 10-11, 18, JA____-____, _____.

Where an agency relies on forecasts for assessing the economic impact of the project, the agency must use those same forecasts to assess environmental impacts. *Scientists' Inst. for Pub. Info.*, 481 F.2d at 1097.

Moreover, courts have held that NEPA requires agencies to perform similar nationwide analyses of impacts on energy markets even where agencies have *not* already undertaken such analyses. In *Mid States*, the Eighth Circuit required the Surface Transportation Board to consider the impacts that a new rail line would have on coal consumption throughout the country, given that the rail line would increase the availability of cheap coal. *Mid States,* 345 F.3d at 549. On remand, the agency used the National Energy Modeling System to assess changes in coal use nationwide, including impacts on air emissions at both "national and regional levels." *Mayo Found. V. Surface Transp. Bd.*, 472 F.3d 545, 555 (8th Cir. 2006). As part of this analysis, the agency also used the model to determine whether the change in coal supply would influence natural gas usage, concluding that on the facts of that case, it would not. *See* Surface Transportation Board, Draft Supplemental EIS, Powder River Basin Expansion Project, Appendix G-3 (April 2005) ("Changes in the delivered price of Wyoming

PRB coal across the cases, primarily lead to a switch to coal from other NEMS supply regions, rather than a switch to other fuels such as natural gas or renewable energy.").[19] Similarly, in *High Country Conservation Advocates v. U.S. Forest Service*, where the Forest Service action at issue would "increase the supply of cheap, low-sulfur coal," the court followed *Mid States* to require the Forest Service to evaluate how "this additional supply will impact the demand for coal relative to other fuel sources, [causing] coal that otherwise would have been left in the ground [to] be burned." 52 F. Supp. 3d 1174, 1198 (D. Colo. 2014). On remand, the Forest Service used a private model comparable to the National Energy Modeling System, concluding that as a result of the project, "the mix of energy sources used to generate the electricity will change," and that these shifts would create quantifiable changes in carbon dioxide emissions. 80 Fed. Reg. 72,665, 72,668 (Nov. 20, 2015).

Exports' effects on gas production and use are precisely the kind of "growth inducing effects" contemplated by NEPA regulations. 40 C.F.R.

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[19] http://www.stb.dot.gov/Decisions/readingroom.nsf/WEBUNID/704822C12D0F05E585256FE30054447D?OpenDocument

§ 1508.8(b). The relationship between exports and gas production, in particular, is more than "reasonably close:" increasing gas production is a central purpose of the export proposal before DOE. Application at 15-16, JA____-____.

D. The Environmental Impacts of These Indirect Effects Are Foreseeable

1. Effects of Increased Gas Production, Processing, and Transportation

DOE did not, and could not, dispute the Environmental Information Administration's conclusion that exports will lead to increased domestic gas production. Nor does DOE dispute the particulars of the Administration's estimates: that production will increase by 61 to 84 percent of the volume of demand created by exports, or that the incremental increase in production will predominantly be hydraulically fractured shale or other forms of unconventional production. EIA Export Study at 10-11, JA____-____, Updated EIA Export Study at 12, JA____.

The EIA Export Study and Updated EIA Export Study indicate the 3,500 bcf/y of exports (the amount that, if authorized, the

Administration expects to occur) would increase domestic gas production by 7 to 10 percent above 2013 levels. When gas consumed in the liquefaction process is accounted for, these exports constitute 3,850 bcf/y of gas demand. EIA Export Study at 2, JA____. Using the studies' estimates of percentage of demand that will be met by new production, these exports would cause increases in gas production equivalent to between 8 and 11 percent of total 2013 production.[20]

The additional 146 bcf/y of exports authorized for Freeport, alone, would be expected to increase domestic gas production by around 100 bcf/y. Over the 20-year authorization period, this would be the entire output of 2,800 new conventional gas wells, or more than 600 hydraulically fractured shale gas wells. Domestic Life Cycle Report at 33, JA____ (providing estimates of total lifetime production of different types of gas wells).

Although DOE does not dispute that exports will increase gas production, DOE argues that it cannot foresee the environmental impacts of this production. DOE contends that it is impossible to predict where additional production will occur "at the wellhead or local level," but that "'nearly all of the environmental issues presented by unconventional natural gas production are local in nature, affecting local water resources, local air quality, and local land use patterns, all under the auspices of state and local regulatory authority.'" Rehearing Order at 16-17, JA____-____ (quoting Authorization Order at 85).

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[20] 61 and 84 percent of 3,850 is 2,350 and 3,230, respectively; 2013 production was 29,500 bcf. EIA, Gas Production Totals.

Any uncertainty about the local impacts of increased gas production is not a basis for failing to address those impacts altogether. Where information regarding impacts is unavailable, agencies must nonetheless provide as comprehensive of an analysis as possible. 40 C.F.R. § 1502.22(b)(3)-(4). DOE must disclose how many tons of air pollution it expects to be emitted by induced gas production, for example, even if the lack of "local level" estimates prevents DOE from assessing the impact of this pollution on air quality.

Moreover, many impacts are not purely "local" in nature. Lack of "local level" information is no basis for omitting discussion of greenhouse gas emissions. Because greenhouse gases impact the climate on large time scales, their contribution to climate change does not depend on where they are emitted. 74 Fed. Reg. 66,496, 66,499 (Dec.15, 2009). DOE offered no argument as to why it could not foresee the impact of increased gas production on greenhouse gas emissions. As explained below, evidence in the record indicates that these emissions will be severe.

Other effects occur at regional, rather than purely local, levels. DOE already provided some regional analysis of how gas production in general affects water resources, and DOE summarized several existing studies that had modeled how increases in gas production would affect regional ozone levels. DOE offered no explanation as to why these tools could not be used to assess the added impacts of export-induced gas production here.

i. Greenhouse Gas Emissions

DOE has provided no explanation for its failure to calculate and take a hard look at the amount of greenhouse gases that would be emitted by induced natural gas production, processing, and transport. The Global Life Cycle report provided tools for estimating the volume of greenhouse gases emitted by each of the stages of the gas life cycle. Global Life Cycle Report at 11, Figure 6-3, JA____; Skone, Timothy, Senior Env'tl Engineer, Nat'l Energy Tech Lab. "LCA GHG Report for LNG Data". Message to Sherri Liang, Associate Analyst, Sierra Club (December 22, 2014). Email, JA____ (providing numeric data underlying Figure 6-3). The report indicates that production, processing, and pipeline transportation of 100 bcf/y of gas, the amount the EIA found likely to be induced by the 146 bcf/y of exports authorized here, will emit 1.76 million tons per year of carbon dioxide equivalent. *Infra* Appendix A (explaining calculation of this estimate). These emissions, indirectly caused by 146 bcf/y of export, are greater than the direct emissions identified in the EIS for operation of the entire 657 bcf/y Freeport project (combining the authorization here with DOE's prior authorization), which were only 1.58 million tons per year of carbon dioxide equivalent. EIS at 4-211, JA_____.

Cumulatively, exporting 3,500 bcf/y of gas will have severe effects on aggregate U.S. greenhouse gas emissions. If all the exported gas were to come from increased gas production, the cumulative effect of extracting this gas, processing it, transporting it to export facilities, and liquefying it would be 96 million tons of carbon dioxide equivalent per year, when calculated using methane's 100-year global warming potential. Appendix A. Using the crucial 20-year global warming potential, the equivalent is 165 million tons per year. *Id.* If, as the EIA expects, some exported gas is made available by electric sector shifts from gas to coal, rather than increased production, the net domestic emission increase would almost certainly be even higher.

These emission levels are astonishingly high, were not disclosed in the EIS, and would seriously interfere with the United States' ability to meet emission reduction targets. NEPA requires DOE to not only calculate these emissions, but also to "evaluate the[ir] severity." *Robertson v. Methow Valley Citizen Council*, 490 U.S. 332, 352 (1989); *see also* 40 C.F.R. § 1502.16(a) -(b) (agencies must inform the public of effects "and their significance"). 96 million tons of carbon dioxide equivalent is, itself, 1.3 percent of total United States greenhouse gas emissions. EPA, Draft GHG Inventory, ES-2,[21] (estimating 2014 U.S. emissions at 7,580 million tons of carbon dioxide equivalent). It is 24% of the maximum annual emission reduction EPA expects to derive from the Clean Power Plan. EPA, Regulatory Impact Analysis for the Clean Power Plan Final Rule, ES-6 (estimating maximum climate benefit of 415 million tons per year). Looking at methane specifically, if exports cause domestic gas production to increase by 10 percent, this will undoubtedly interfere with the U.S.'s goal of achieving a 40 percent reduction in the total amount of methane emitted from gas production. White House, Fact Sheet: Administration Takes Steps Forward on Climate Action Plan by Announcing Actions to Cut Methane Emissions.

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[21] https://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2016-Chapter-Executive-Summary.pdf

Here, DOE offered no explanation for its failure to calculate the amount of greenhouse gases that would be emitted by export-induced gas production or for its failure to discuss the impact of these emissions. Because these emissions are clearly a reasonably foreseeable indirect effect of the Freeport exports, and of DOE's cumulative approval of export projects, failure to take a hard look at these emissions was arbitrary and capcricious.

ii. Water Impacts

Gas production, and hydraulically fractured shale gas in particular, consumes large volumes of water: literally millions of gallons per shale gas well. Addendum at 10, JA____. Gas production—

particularly shale gas and coalbed methane production—also produces large volumes of contaminated wastewater. *Id.* at 18, JA____. Nearly all of this wastewater is disposed of in underground injection wells, which causes a range of environmental impacts. Unconventional Production Report at 99-100, JA____-_____.

Although some of the impacts on water are undoubtedly "local in nature," Authorization Order at 85, JA____, the Authorization Order also discusses these impacts at the regional, "shale play" level. *Id.* at 49, JA____. For example, DOE recognizes that in Texas's arid Eagle Ford shale, between 3 and 6 percent of available water is used for existing shale gas production. *Id.* at 49, JA____; *see also* Unconventional Production Report at 6, JA____ (map illustrating "Lower 48 states shale plays").

DOE could have, at a minimum, disclosed how export-driven increases in gas production would affect these regional totals. DOE has tools to assess how much additional production will occur in each gas play. The National Energy Modeling System provides a play-level model of natural gas production in the lower 48 states. EIA, Documentation of the Oil and Gas Supply Module (2011), at 2-2, JA____. This is the same tool the EIA used to develop its two export studies. EIA Export Study at 2, JA____, Updated EIA Export Study at 9, JA____.[22] DOE acknowledged that "the size of shale plays makes them more reliable [than smaller geographic units] units for generating predictions from economic models," and did not dispute that play-level modeling of the extent to which given export volumes would increase gas production was possible. Rehearing Order at 18, JA____. DOE also has tools to predict the amount of water consumed, and wastewater produced, by those play-level increases in production. Domestic Life Cycle Report at 55, JA____.

Thus, DOE discussed the effects of existing gas production on water resources at the "play" level, had the tools to predict how exports would increase gas production in individual plays, and had the tools to assess the water impacts of the incremental production. In these circumstances, DOE's conclusion that impacts of export-driven production increases on water sources were entirely unforeseeable, and DOE's complete failure to disclose these impacts, was arbitrary and capricious.

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[22] Other available models also have this capability. *See, e.g.*, Deloitte MarketPoint, *Analysis of Economic Impact of LNG Exports from the United States* (2012) at 25, JA____ (explaining that Deloitte's model is built on representations of "575 plays in the US"), 14, JA____ (predicting the volume of "incremental production" resulting from a single export project, allocated among five individual major shale gas plays, other gas plays, and non-shale sources).

iii. Ozone Impacts

Gas production caused by exports will also have foreseeable and potentially significant impacts on regional ozone levels. Ground level ozone is formed by the interaction of volatile organic chemicals and nitrogen oxides, and has serious impacts on human health and the environment. Addendum at 25, JA____.

EPA has explained that ozone formation and impacts often occur "on a regional scale (*i.e.*, thousands of kilometers)." EPA, Cross-State Air Pollution Rule, 76 Fed. Reg. 48,208, 48,222 (Aug. 8, 2011); *see also Sierra Club v. EPA,* 774 F.3d 383, 385, 397-99 (7th Cir. 2014) (upholding EPA analysis that assesses ozone precursor reductions across a 22-state region as sufficient to demonstrate impacts on three discrete urban areas).

In some regions, gas production is the primary contributor to ozone levels that violate EPA's national ambient air quality standards.

Addendum at 28, JA____. For example, "in the area around Pinedale, Wyoming, the … inventory of emissions for the ozone nonattainment area and the surrounding counties shows that 94 percent of [volatile organic chemical] emissions and 60 percent of [nitrogen oxide] emissions in the Upper Green River Basin are attributable to oil and gas production and development." *Id.* Nationwide, volatile organic chemical "emissions from oil & gas operations [are] about 2.7 million tons per year …, which represents about 21 percent of nationwide VOC emissions." *Id.* at 20, JA____.

Exports are likely to aggravate ozone problems. Looking solely at the exports authorized here, ozone precursor emissions from induced incremental production, processing, and transportation are likely to be hundreds of times greater than the direct emissions disclosed in the EIS. The National Energy Technology Laboratory provides estimates of the amount of pollution emitted throughout the natural gas lifecycle. *See* Domestic Life Cycle Report at 50, JA____. Using the estimates for the average of existing U.S. generation—which underestimates the emissions that would be caused by export-driven production[23]—suggests that the production, processing, and transportation of 100 bcf/y of natural gas—roughly the amount that will be induced by the exports authorized here—will emit 2,810 tons per year of volatile organic chemicals and 8,900 tons per year of nitrogen oxides. *Id.*, *infra* Appendix A (explaining derivation of these estimates). In contrast, the EIS DOE relied on in approving these exports disclosed operating emissions of only of 24 and 65 tons per year of these two pollutants, respectively. EIS 4-211, JA____.[24] Looking at exports cumulatively, the 10 percent increase in domestic gas production that is likely to result from cumulative exports would presumably significantly impact volatile organic chemical emissions, and thus ozone levels, in many parts of the nation, given DOE's admission that existing oil and gas production "represents about 21 percent of nationwide VOC emissions." Addendum at 20, JA____.

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[23] The average is unrepresentative because offshore production plays a significant role in the United State's current gas production mix, Natural Gas Gross Withdrawals and Production (Feb. 29, 2016), but the EIA estimates that incremental production induced by exports will be almost entirely onshore, and will be more than 90% unconventional. Export Study at 11, JA____. Unconventional onshore gas production has significantly higher emissions than offshore production, Domestic Life Cycle Report at 50, JA____, Unconventional Production Report at 64, 68, JA____, ____. DOE should also account for regional variation in emissions. *Id.*

[24] Values from the EIS reflect the facility's total operation, *i.e.*, treatment and liquefaction of 657 bcf/y of gas, not just the 146 bcf/y authorized by DOE here.

These emissions of additional ozone precursors are plainly foreseeable. Moreover, as with water impacts, DOE has the tools to assess the impact of these increases at the regional level. The Rehearing Order states that such "play-level modeling" would not enable DOE to assess impacts on ozone, Rehearing Order at 18 n.68, JA____, but DOE's own Addendum summarized, without criticism, a study that did precisely this. Addendum at 28-29, JA____-____. This study found that increasing from low to high gas development in the Haynesville Shale would significantly impact ozone throughout east Texas/west Louisiana region. Susan Kemball-Cook, *et al.*, *Ozone Impacts of Natural Gas Development in the Haynesville Shale*, 44 Envtl. Sci. & Tech. 9357, 9360-61 (2010) JA____-____. The Addendum also summarized another study using the same underlying modeling tool, the Comprehensive Air-quality Model with extensions ("CAMx"), which assessed the ozone impacts of drilling and operating 8,950 new gas wells, over a 40 to 50 year period, in an area spanning approximately 1.1 million acres (1,672 square miles) in Wyoming. Bureau of Land Management, Continental Divide-Creston Natural Gas Development Project Draft EIS (Nov. 2012), ES-1, JA_____. Although that EIS concluded that expanded drilling would not significantly affect ozone levels in the nearest nonattainment area—near Pinedale, Wyoming, over 100 miles away and largely upwind—it demonstrated that regional analysis of ozone impacts was possible, and found impacts extending outside the area of development. *Id.* at Executive Summary ES-3, Air Quality Technical Support Document 4-50 to 4-51, JA____, ____-____. In places like the Gulf Coast and Northeast, where drilling occurs closer to areas with existing ozone problems, increasing gas production is likely to have a greater impact. *See also* Alamo Area Council of Governments, *Development of the Extended June 2006 Photochemical Modeling Episode* at v (October 2013) (concluding, on the basis of similar modeling, that increasing oil and gas production in Texas's Eagle Ford shale would increase ozone levels such that it would be difficult for the

San Antonio-New Braunfels area to meet ozone standards below 75 parts per billion).[25]

The Addendum states that "quantitative analysis and modeling" of impacts on ozone is "a challenge." Addendum at 27, JA____. Evidence provided in the Addendum itself, however, demonstrates that it is possible. NEPA requires agencies to affirmatively investigate impacts using tools that are available. 40 C.F.R. § 1502.22. Accordingly, DOE's failure to discuss the extent to which export-induced gas production would increase emissions of ozone precuror's, or the effect these emissions would have on regional ozone levels, was arbitrary and capricious.

2. Effects of Increased Coal Use

All forecasts in the record also indicate that exports will increase domestic coal use, as utilities respond to export-driven gas price increases by shifting some generation from gas to coal. *E.g.*, EIA Export Study at 6, 12, 18, JA____, ____, ____.

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[25] https://www.aacog.com/DocumentCenter/View/19262

Coal combustion, like gas production, has serious environmental impacts, including emission of ozone-forming pollution and copious amounts of carbon dioxide. Sierra Club Protest at 35-36, JA____-____. A plethora of tools are available to predict the impact of incremental shifts from gas to coal use in the electric sector. Notably, the EIA's National Energy Modeling System itself models air pollutants emitted by electricity generation. *Mayo Found.*, 472 F.3d at 555. The 2011 Export Study used this system to estimate the effect of exports on nationwide fossil fuel *combustion* greenhouse gas emissions, although the study did not address methane emissions and other emissions upstream in the natural gas lifecycle. EIA Export Study at 18, JA____. The National Energy Modeling System has also already been used to inform NEPA analysis of the nationwide impact of a proposed project that would cause an increase in coal-fired electricity generation. *Mayo Found.*, 472 F.3d at 555 (evaluating, on remand from *Mid States*, the effects of a railroad that would improve market access to coal, considering a range of air pollutants).

DOE argues that the EIA Export Study's prediction of increased coal use is likely to be wrong, because EPA has subsequently adopted regulations that will limit coal use. Authorization Order at 89-90, JA____-____; Rehearing Order at 23, JA____. DOE asserted that these regulations "have the potential to mitigate significantly any increased emissions from the U.S. electric power sector that would otherwise result from increased use of coal, and perhaps to negate those increased emissions entirely." *Id.* at 90, JA____. This assertion, unsupported by any analysis, falls far short of the hard look NEPA requires. First, DOE has not seen a need to revisit the EIA Export Study's predictions of price increases or other economic effects. Insofar as DOE believes that this study remains sufficiently reliable to inform economic predictions, DOE cannot contend that it is inadequate to support environmental analysis. *Scientists' Inst. for Pub. Info.*, 481 F.2d at 1097. Second, the EIA Updated Export Study indicates that exports are likely to increase coal use despite the promulgation of these regulations. The updated study included an "accelerated coal and nuclear retirement" case that assumed that regulations would make coal use much less economically attractive. EIA Updated Export Study at 5, JA____. The study found that in this scenario, exports would cause a smaller—but still significant—increase in coal use, and a correspondingly greater increase in natural gas production. *Id.* Table B2, JA____. Although this study was released before the Authorization Order, and over a year before the Rehearing Order, DOE has not acknowledged its conclusion regarding the impacts of new regulations on export driven gas-to-coal shifting.

3. Effects of Use of LNG in Overseas Markets

Just as all gas exported must come from somewhere, all exported liquefied natural gas must be transported overseas by tanker, regasified, transported to end users, and combusted. The greenhouse gases emitted by these processes are foreseeable, and can be reasonably estimated. The Global Life Cycle Report provides such estimates, although only in the abstract, untethered to either the volume of exports authorized here or any estimate of cumulative exports. Global Lifecycle Report at 8, JA____.

Most exported natural gas is likely to be used for electricity generation. *See* Authorization Order at 57. Some fraction of this generation will represent growth, *i.e.*, an increase in the overall amount of electricity generated. *Id.* at 92, JA____; Sierra Club Comment on Global Life Cycle Report at 3, JA____ (summarizing the International Energy Agency's conclusion, in its "Golden Rules for a Golden Age of

Gas" report, that increases in gas availability will increase overall energy consumption). The remainder, however, will displace other energy sources, including coal, other sources of natural gas, and renewables. Authorization Order at 92-93, JA____-____.

DOE stated that it was impossible to "model" the extent to which U.S. exports would displace particular alternative energy sources, or increase overall energy consumption. *Id.* at 93, JA___; Rehearing Order at 35, JA_____. If, however, "the *nature* of [an] effect is reasonably foreseeable [even though] its extent is not, … the agency may not simply ignore the effect." *Mid States*, 345 F.3d at 459.

DOE determined that it would be "useful" to compare the effects of generating electricity with the effects of the current "prevalent fuel sources for electric generation" in potential importing nations. Authorization Order at 93, JA____. DOE argued that coal and gas were the prevalent fuel sources, citing the portion of generating capacity constituted by these fuels in India, China, and Japan. *Id.* However, the documents DOE cited indicate that by this measure, renewables are already far more prevalent than gas in India and China. EIA, China Analysis Brief (last updated Feb. 4, 2014), JA____ (identifying China's

2011 electrical capacity mix as 65% coal, 22% hydropower, 6% wind, 3% natural gas, 3% oil, 1% nuclear, 0.2% solar); EIA, India Analysis Brief (last updated June 26, 2014), JA____ (identifying India's 2014 installed capacity mix at 59% coal, 16% hydro, 13% "other renewables," and 9% natural gas).

Thus, at a minimum, DOE should have provided comparisons of the effect of electricity generation using U.S. LNG with the effect of wind, solar, or other renewables, similar to the comparisons with coal and other sources of natural gas.

This more complete range of comparisons would have enabled DOE to undertake further analysis. For example, even if DOE could not "model" the extent to which U.S. LNG would displace other fuels, DOE could have presented a range of illustrative figures, if "reasonabl[y] … speculat[ive]," *Del. Riverkeeper*, 753 F.3d at 1310, and examined the climate impact of each. *See, e.g.,* EIA Export Study at 2, JA____ (responding to uncertainty about future productivity of gas wells by constructing reference, high, and low recovery baseline scenarios).

III. Natural Gas Act

In addition to violating NEPA, DOE acted arbitrarily in determining whether Freeport's proposed exports would be consistent with the public interest, pursuant to 15 U.S.C. § 717b(a). DOE has acknowledged that it must weigh effects on the environment in making that determination. Authorization Order at 9, JA____; *Myersville Citizens for a Rural Cmty.*, 783 F.3d at 1307. DOE also recognizes that export-induced gas production will have adverse environmental impacts, notwithstanding DOE's conclusion that these impacts are not sufficiently foreseeable to warrant NEPA analysis. *See, e.g.*, Authorization Order at 86, JA____.

DOE concluded that exports would provide benefits that outweighed these environmental costs. Because DOE did not "attempt to identify or characterize the incremental environmental impacts" of exports, Authorization Order at 84, JA____, this conclusion was inherently arbitrary: DOE cannot rationally conclude that benefits outweigh costs while admitting that DOE has provided no information on what the costs weigh. *Motor Vehicle Mfrs. Ass'n of U.S*, 463 U.S. at 52.

DOE explained its conclusion with the following:

> A decision to prohibit exports of natural gas would cause the United States to forego *entirely* the economic and international benefits identified in the [Freeport] Conditional Order ..., but would have little more than a *modest, incremental* impact on the environmental issues identified by Sierra Club and others.

Authorization Order at 87, JA____ (emphases added). DOE provides no explanation as to how it determined that the environmental impacts of denial would be "modest" and "incremental." Prohibiting exports would, tautologically, *entirely* prevent the environmental impacts caused by export-induced increases in gas production. The only plausible interpretation of DOE's statement is that DOE is referring to an incremental impact on the harm caused by all natural gas production, whether induced by export or otherwise. But a modest impact on such a large issue can, in absolute terms, matter a great deal. Conversely, exports will only provide a "modest, incremental" increase in the economic benefits provided by overall gas production. The NERA study concluded that even 4,380 bcf/y of exports would increase gross domestic product by only 0.05 percent. NERA Study at 188, JA____.

Implicit in the Natural Gas Act's requirement to consider environmental factors in the public interest analysis is a requirement to provide some analysis of the significance of environmental effects of proposed exports. Here, where DOE did not "identify or characterize the incremental environmental impacts" of exports, DOE's conclusion that these impacts would be outweighed by other benefits was arbitrary and capricious. Authorization Order at 84, JA____.

CONCLUSION

For the reasons set forth above, Sierra Club respectfully requests that DOE's Authorization Order and Rehearing Order be vacated and remanded.

Dated: March 21, 2016.

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Appendix A

Ozone Precursor Emissions

The Domestic Life Cycle Report estimates average "cradle to gate" emissions of 0.0235 grams of volatile organic chemicals and 0.0745 grams of nitrogen oxides per megajoule of gas. Domestic Life Cycle Report at 50, JA____. Sierra Club used the following to convert to emissions per unit of gas:

$$10^9 \text{ scf} \quad * \quad \frac{1{,}027 \text{ Btu}[26]}{\text{scf}} \quad * \quad \frac{1{,}055 \text{ MJ}[27]}{10^6 \text{ Btu}} \quad = \quad 1.08 * 10^9 \text{ MJ}$$

Delivering 100 bcf/y of gas (attributable to Freeport's exports) would emit 2,810 tons of volatile organic chemicals and 8,900 tons of nitrogen oxides per year.

Greenhouse Gas Emissions

The Global Life Cycle Report estimates greenhouse gas emissions from natural gas extraction, processing, domestic pipeline transportation, and liquefaction in tons of carbon dioxide equivalent

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[26] Domestic Life Cycle Report at 18, 22, JA____, ____.
[27] http://www.nist.gov/pml/wmd/metric/upload/SP1038.pdf

("CO_2e") per megawatt-hour generated in a hypothetical power plant. Global Life Cycle Report Fig. 6-3, JA____; Email from Timothy Skone, Sr. Env'tl Engineer, Nat'l Energy Tech. Lab., to Sherri Liang, Associate Analyst, Sierra Club (Dec. 22, 2014, 10:06 a.m.), JA____. DOE admits that these values understate the global warming potential ("GWP") of methane by omitting "climate carbon feedbacks." Rehearing Order at 30, JA____. Adding these feedbacks for methane produces the following:

Upstream emissions per MWh of electricity generated, kilograms CO_2e

	100-year GWP	20-year GWP
Extraction through domestic transport	115	235
Extraction through liquefaction	178	299

These values can be converted to emissions per bcf of gas:

$$10^9 \text{ scf} \quad * \quad \frac{1{,}027 \text{ Btu}}{\text{scf}} \quad * \quad \frac{1 \text{ kWh}[28]}{7{,}351 \text{ Btu}} \quad = \quad 139{,}700 \text{ MWh}$$

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28 Global Life Cycle Report at 6, JA____, Domestic Life Cycle Report at 30, JA____ (providing assumed efficiency of gas-fired power plants)

CERTIFICATE OF COMPLIANCE WITH WORD LIMITATION

Counsel hereby certifies that, in accordance with Federal Rule of Appellate Procedure 32(a)(7)(C), the foregoing Proof Opening Brief of Petitioner Sierra Club contains 13,762words, as counted by counsel's Microsoft Word processing program.

Dated: March 21, 2016.

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CERTIFICATE OF SERVICE

I hereby certify that on this 21st day of March, 2016, I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system, which will send notice of such filing to all registered CM/ECF users.

/s/ Nathan Matthews
Nathan Matthews